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Chrotopterus auritus (Peters, 1856) (Chiroptera, Phyllostomidae): first record for the state of Rio Grande do Norte, northeastern Brazil

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Abstract. *Chrotopterus auritus* is a phyllostomid bat with a wide distribution in the Neotropics. It has been recorded in Brazil's 6 biomes but with few records in the Caatinga. We provide the first record of *C. auritus* for Rio Grande do Norte state, northeastern Brazil, based on records from 2 caves, Três Inchu and Gruta da Carrapateira. The nearest records are ca. 400 km southeast in Ceará state and ca. 350 km northwest in Pernambuco state. Our new records fill the northeastern distributional gap of *C. auritus* in Brazil and South America.

Key words. Bats; *Chrotopterus;* geographic distribution; Caatinga; caves

Chrotopterus auritus(Peters, 1856) is one the largest phyllostomid bats and the single representative of the genus *Chrotopterus* Peters, 1865 (Simmons 2005). As well as *Vampyrum spectrum* (Linnaeus, 1758) and *Trachops cirrhosus* (Spix, 1823), *C. auritus* is considered a predominantly carnivorous species (Ferrarezzi & Gimenez 1996) but occasionally including insects (Medellín 1988) and fruits (Bernard 2002) in its diet. It is known to occur in southern Mexico, Central America, Colombia, Venezuela, Guyana, Surinam, French Guiana, Brazil, Ecuador, Peru, Bolivia, Paraguay, and northern Argentina (Williams & Genoways 2008). In Brazil, this species has been recorded in all biomes (Paglia et al. 2012) but there are few records for the Caatinga (Fig. 1; Table 1). The Caatinga is restricted to Brazil and is a mosaic of tropical dry forest with xeric shrublands (Leal et al. 2003). With a predominant semi-arid climate (MMA 2017) and located in the Northeast Region, the Caatinga has an area of over 800,000 km^2, which represents about 11% of Brazil's territory, and covering 9 states and the northern part Minas Gerais. Herein, we provide the first occurrence record of *Chrotopterus auritus* for the state of Rio Grande do Norte, northeastern Brazil, based on records from 2 separate caves in the Caatinga on the west side of the state.

On 28 August 2015 at 23:40 h an individual of *C. auritus* was observed and photographed in the Gruta da Carrapateira. Capture attempts were unsuccessful but the individual was identified through direct observation using binoculars and photographic records. The calcareous cave is located in the municipality of Felipe Guerra (05°33′38.2″ S, 037°39′50.3″ W, altitude ca. 32 m) about 348 km west of Natal and has 5 entrances and a linear development of 242.2 m.

The second record is based on a colony of 8 individuals and an adult male captured with a hand net (Fig. 3) inside the Três Inchu cave (06°03′07″ S, 037°54′03″ W) on 18 December 2015. The Três Inchu is a marble cave located in the municipality of Martins, ca. 362 km from Natal, with a linear development of 146.0 m and 5 recognized entrances, some of which are skylights, providing for photic zones inside.

The Três Inchu specimen was handled in accordance with Sikes et al. (2011), euthanized and fixed in 10% formaldehyde and preserved in 70% ethanol with subsequent extraction of the skull (Fig. 2). Cranial and external measurements were taken following Vizotto & Taddei (1973) using a digital caliper (0.2 mm). The specimen was collected under permit SISBIO/IBAMA 52492-1 and is deposited in the mammal collection of the Federal University of Sergipe (CMUFS) under voucher number CMUFS 259.

Our voucher of *Chrotopterus auritus* has the set of characters that distinguish this species from other members of the Phyllostominae, such as its large size (forearm 74–83 mm), presence of 1 pair of lower incisors and 3 lower premolars (Fig. 2), rudimentary tail, calcar longer than the foot, large rounded ears not connected by a band, horseshoe of noseleaf cup-shaped and continuous with spear, and long thumb with a large strongly curved claw (Fig. 3) (Medellín 1989; Williams

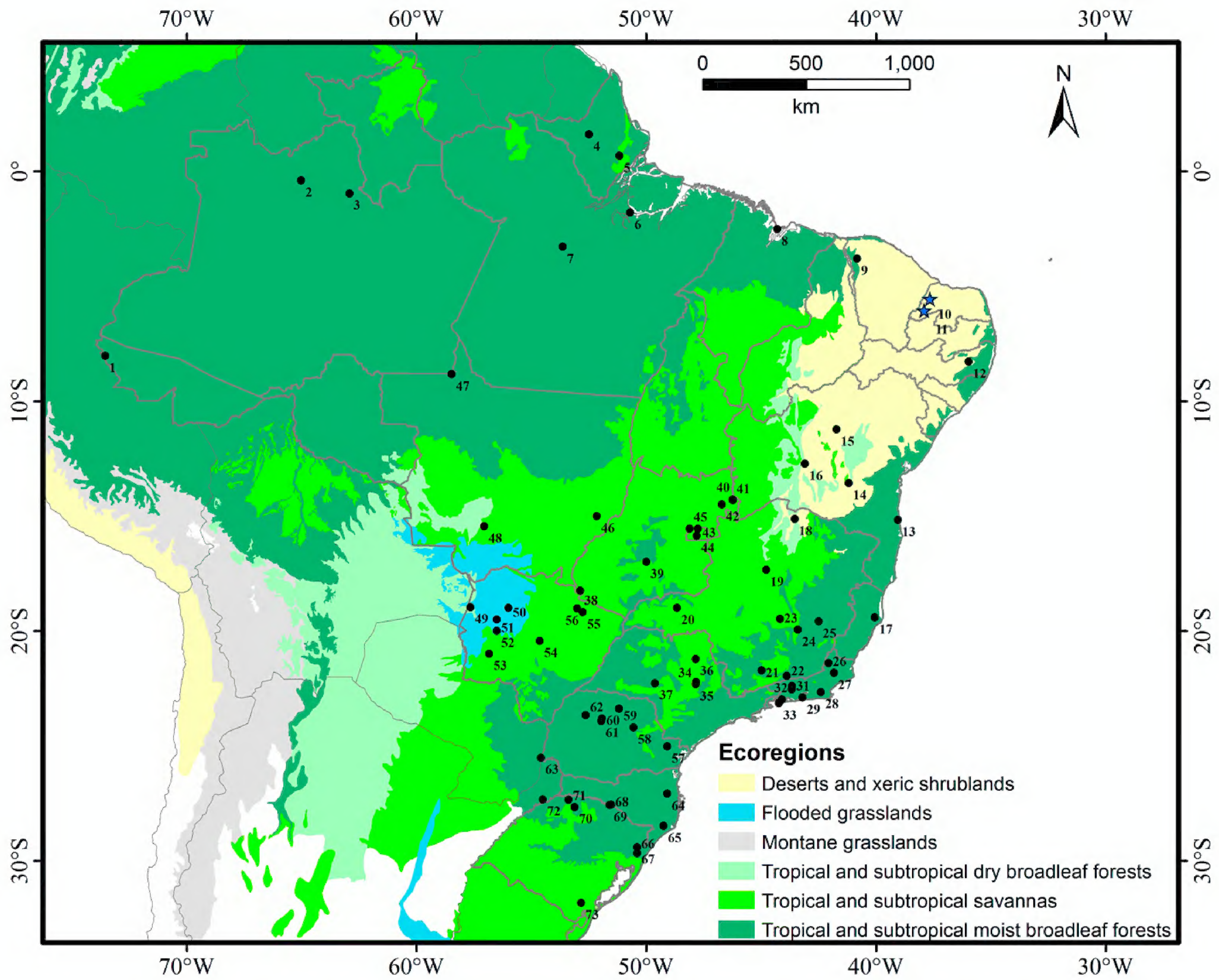

Figure 1. Records of *Chrotopterus auritus* in Brazil. The numbers corresponding to the records are indicated in Table 1. Blue stars represent the new records from the state of Rio Grande do Norte, Brazil.

Table 1. Locality records for *Chrotopterus auritus* in Brazil. The code numbers refer to the points shown in Figure 1.

Code	Locality	State	Latitude (S)	Longitude (W)	References
1	Parque Nacional da Serra do Divisor	AC	08°03′	073°55′	Nogueira (1999)
2	Santa Isabel do Rio Negro	AM	00°04′	065°01′	Moratelli et al. (2010)
3	Barcelos	AM	00°96′	062°91′	Moratelli et al. (2010)
4	Parque Nacional Montanha do Tumucumaque	AP	01°06′	052°48′	Martins et al. (2006)
5	Floresta Nacional do Amapá	AP	00°66′	051°16′	Martins et al. (2006)
6	Melgaço	PA	01°08′	050°07′	Marques-Aguiar et al. (2003)
7	Uruará	PA	03°28′	053°63′	Cajaiba (2014)
8	São Luiz	MA	02°51′	044°03′	Cruz et al. (2007)
9	Ubajara	CE	03°08′	040°83′	Ueda et al. (1980)
10	Gruta da Carrapateira cave, Felipe Guerra	RN	05°55′	037°65′	This study
11	Três Inchu cave, Martins	RN	06°05′	037°09′	This study
12	Ecológico Municipal Professor João Vasconcelos Sobrinho, Caruaru	PE	08°28′	035°96′	Sousa et al. (2004)
13	Una	BA	15°16′	039°05′	Faria et al. (2006)
14	Chapada Diamantina	BA	13°56′	041°18′	Gregorin & Mendes (1999)
15	Chapada Diamantina	BA	11°23′	041°71′	Sbragia & Cardoso (2008)
16	Médio São Francisco, Paratinga	BA	12°73′	043°09′	Sá-Neto & Marinho-Filho (2013)
17	Linhares	ES	19°41′	040°05′	Peracchi & Albuquerque (1993)

Continued

Table 1. *Continued.*

Code	Locality	State	Latitude (S)	Longitude (W)	References
18	Jaíba	MG	15°13′	043°54′	Nogueira et al. (2015)
19	Piarapora	MG	17°35′	044°78′	Tavares et al. (2010)
20	Uberlândia	MG	19°00′	048°66′	Pedro & Taddei (2014)
21	São Tomé das Letras	MG	21°71′	044°98′	Tavares et al. (2010)
22	Serra Negra	MG	21°96′	043°88′	Nobre et al. (2009)
23	Sete Lagoas	MG	19°84′	044°18′	Tavares et al. (2010)
24	Santa Barbara	MG	19°95′	043°04′	Tavares et al. (2010)
25	Serra da Mantiqueira	MG	19°58′	042°05′	Stallings et al. (1990)
26	Paraíso do Tobias, Miracema	RJ	21°04′	042°06′	Esbérard et al. (2010)
27	Parque Estadual Desengano	RJ	21°83′	041°83′	Modesto et al. (2008)
28	Silva Jardim	RJ	22°66′	042°39′	Baptista & Mello (2001)
29	Pedra Branca	RJ	22°09′	043°02′	Dias et al. (2002)
30	Engenheiro Paulo de Frontin	RJ	22°55′	043°66′	Dias et al. (2010)
31	Vassouras	RJ	22°04′	043°65′	Dias et al.(2002)
32	Mangaratiba	RJ	22°98′	044°01′	Luz et al. (2011)
33	Ilha Grande - Angra dos Reis	RJ	23°15′	044°22′	Esbérard et al. (2006)
34	Itaperina	SP	22°23′	047°83′	Uieda et al. (2007)
35	Estação Experimental de Itirapina	SP	22°32′	047°84′	Sato et al. (2015)
36	Ribeirão Preto	SP	21°22′	047°84′	Passos et al. (2003)
37	Estação Ecológica dos Caetetus, Gália	SP	22°27′	049°61′	Pedro et al. (2014)
38	Parque Nacional das Emas	GO	18°25′	052°88′	Rodrigues et al. (2002)
39	Indiara	GO	17°00′	050°00′	Silva et al. (2011)
40	Posse	GO	14°31′	046°23′	Esbérard et al. (2001)
41	APA Nascente Rio Vermelho	GO	14°28′	046°25′	Esbérard et al. (2005)
42	Alvorada do Norte	GO	14°05′	046°71′	Bezerra & Marinho-Filho (2010)
43	Planaltina	DF	15°55′	047°75′	Bredt & Magalhaes (1999)
44	Paranoá	DF	15°86′	047°08′	Bredt & Magalhaes (1999)
45	Brazlândia	DF	15°55′	048°11′	Bredt & Magalhaes (1999)
46	Near to Nova Xavantina	MT	15°01′	052°15′	Oliveira et al. (2015)
47	Cedro Trail, lower Juruena River	MT	08°83′	058°46′	Dalponte et al. (2016)
48	Estação Ecologica Serra das Araras	MT	15°45′	057°05′	Gonçalves & Gregorin (2004)
49	Corumbá	MS	18°96′	057°65′	Bordignon & França (2004)
50	Nhecolândia	MS	19°00′	056°00′	Oliveira et al. (2011)
51	Abobral	MS	19°05′	056°5′	Oliveira et al. (2011)
52	Miranda	MS	20°00′	056°05′	Oliveira et al. (2011)
53	Parque Nacional Serra da Bodoquena	MS	20°99′	056°83′	Camargo et al. (2009)
54	Campo Grande	MS	20°43′	054°63′	Bordignon (2005)
55	Chapadão do Sul	MS	19°18′	052°76′	Bordignon et al. (2006)
56	Paraíso das Águas	MS	19°02′	053°01′	Dalponte et al. (2016)
57	Campinhos	PR	25°03′	049°08′	Arnone & Passos (2003)
58	Telêmaco Borba	PR	24°02′	050°55′	Reis et al. (1999)
59	Londrina	PR	23°38′	051°18′	Reis et al. (2003)
60	São Pedro do Ivaí	PR	23°81′	051°93′	Carneiro (2008)
61	Fênix	PR	23°91′	051°95′	Bianconi et al. (2004)
62	Cianorte	PR	23°66′	052°63′	Ortêncio-Filho & Reis (2009)
63	Foz do Iguaçú	PR	25°51′	054°58′	Graciolli & Carvalho (2001)
64	Blumenau	SC	27°08′	049°08′	Althoff (2007)
65	Pedras Grandes	SC	28°48′	049°25′	Carvalho et al. (2013)
66	Vale do Taquari	RS	29°66′	050°04′	Kasper et al. (2007)
67	São Francisco de Paula	RS	29°41′	050°04′	Marques et al. (2011)
68	Barracão	RS	27°56′	051°53W	Witt et al. (2010)
69	Machadinho	RS	27°58′	051°06′	Witt et al. (2010)
70	Rio Grande do Sul	RS	27°66′	053°11′	Peters et al. (2010)
71	Frederico Westphalen	RS	27°33′	053°38′	Bernardi et al. (2009)
72	Derrubados	RS	27°33′	054°05′	Kasper et al. (2007)
73	Rio Grande	RS	31º49′	052º49′ W	Quintela et al. (2011)

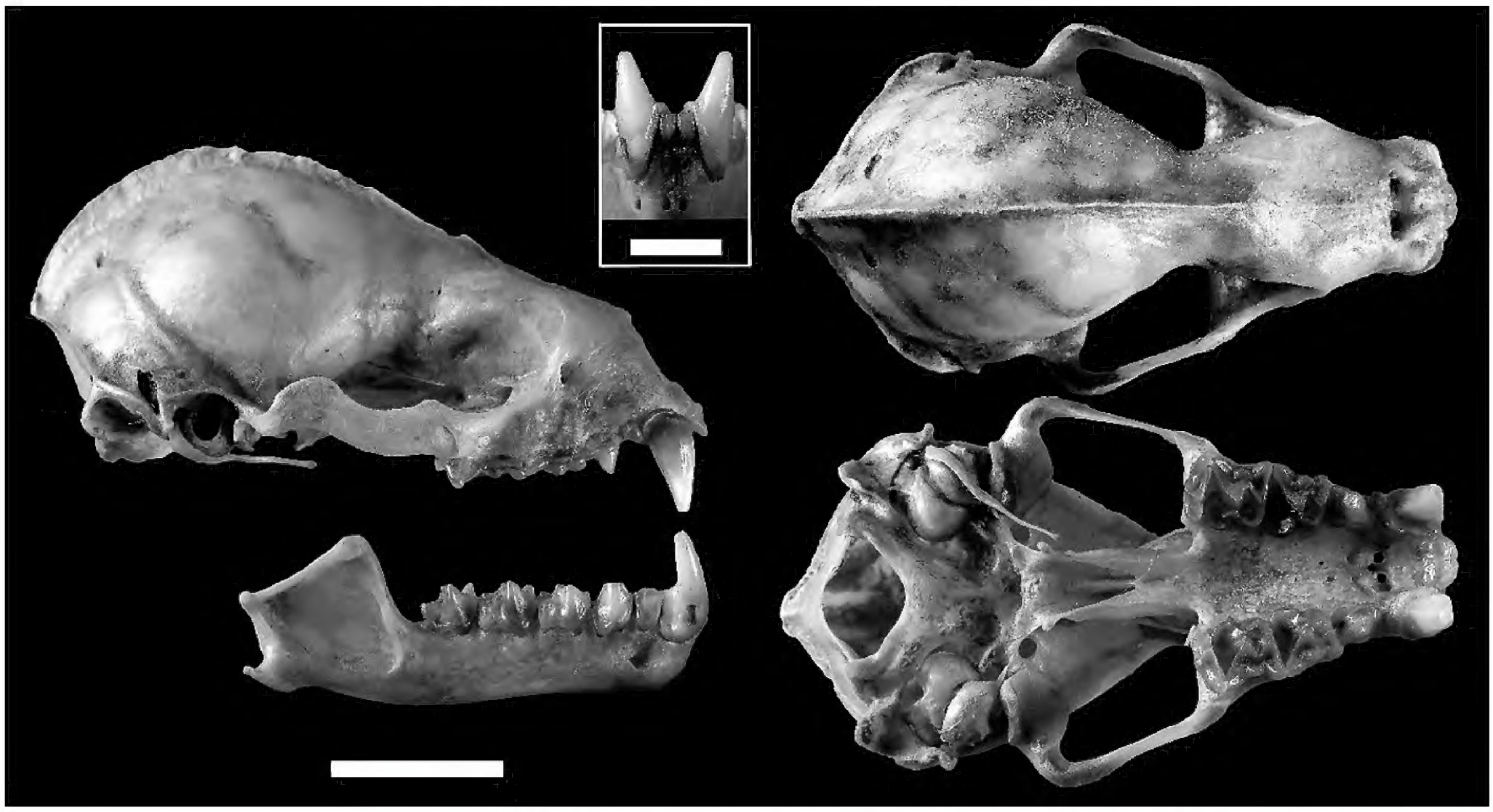

Figure 2. Dorsal, ventral and lateral views of the skull and lateral view of the mandible (scale bar=10 mm) of *Chrotopterus auritus* (CMUFS 259) from Três Inchu cave, Martins municipality, Rio Grande do Norte state, northeast Brazil. In detail, front view of the mandible showing the presence of 2 incisors (scale bar = 5 mm).

& Genoways 2008).

Cranial and external measurements of the voucher, in millimeters, are: forearm length (84.6), hind foot length (21.1), calcar (22.3), ear (36.2), greatest length of skull (37.12), condylobasal length (32.41), breadth of braincase (14.28), post-orbital constriction (6.06), breadth across upper molars (12.18), breadth across upper canines (7.92), length of mandible (24.78) and length of maxillary tooth row (15.18). These measurements are within the known range for the species (see Medellín 1988). In the case of the individual from Gruta da Carrapateira, not captured, it was possible to see external diagnostic characters of *C. auritus*, such as the cup-shaped horseshoe of the noseleaf and the long thumbs with large claw.

Our records of *Chrotopterus auritus* from Rio Grande do Norte fill the distributional gap of this species in northeastern Brazil. They extend the distribution of *C. auritus* in ca. 400 km southeast and 350 km northwest from the Ceará (Uieda et al. 1980) and Pernambuco (Sousa et al. 2004) states, respectively.

The presence of *C. auritus* within the Caatinga may be unusual, since there are only 6 previous records from this biome (Fig. 1; Table 1). The records are: in xeric-woodlands of Caatinga (Sá-Neto & Marinho-Filho 2013); in Chapada Diamantina National Park in Bahia state (Gregorin & Mendes 1999; Sbragia & Cardoso 2008); in transition areas of Caatinga and the Amazon (Uieda et al. 1980); in humid forest enclaves within the Caatinga known as "Brejos de Altitude" (Sousa et al. 2004); and in the southern limit of the Caatinga in Jaíba, northern Minas Gerais state (Nogueira et al.2015). Moreover, 4 of these records were obtained from underground cavities (Gregorin & Mendes 1999; Sbragia &

Figure 3. *Chrotopterus auritus* photographed at the Gruta Três Inchu, Martins municipality, Rio Grande do Norte state, northeast Brazil. Note the long thumb (arrow a) with a large strongly curved claw and the cup-shaped horseshoe of noseleaf (arrow b).

Cardoso 2008; Uieda et al.1980; Nogueira et al. 2015).

Chrotopterus auritus is known to roostin caves, abandoned mines, buildings, and hollow trees (Reid 2009). It inhabits mature evergreen forest and deciduous forests, but records in this latter formation are less common (Medellín 1989). Because *C. auritus* is a top predator, more regularly found in undisturbed habitats, its presence is considered an indicator of healthy forests (Medellín 1989; Gorrensen & Willig 2004). Individuals generally form small groups from 3 to 6 individuals in their roost (Arita & Vargas 1995; Bredt et al. 1999). When roosting in caves, this species is commonly found in cohabitation with other bat species (Coimbra et al. 1982; Trajano 1985; Bredt et al. 1999). We observed *C. auritus* cohabitating with *Desmodus rotundus* (E. Geoffroy, 1810) and *Peropteryx macrotis* (Wagner, 1843) in Três Inchu cave and with *Artibeus planirostris* (Spix, 1823), *Furipterus horrens*(F. Cuvier, 1828), *Desmodus rotundus, Diphylla ecaudata* Spix, 1823, *Glossophaga soricina* (Pallas, 1766) and *P. macrotis* in Gruta da Carrapateira.

Caves in the Caatinga, including those in the state of Rio Grande do Norte, may be important roosting sites for *C. auritus,* and the presence of a high density of caves in the landscape may be a good predictor of a potential occurrence of this species. Furthermore, roosting in caves may provide benefits to *C. auritus* besides providing stable roost conditions. The cohabitation with others bats inside caves may allow for the predation of other smaller bats, a behavior already reported for *C. auritus* (Bordignon 2005; Witt & Fabian 2010).

Rio Grande do Norte is one of the least known states in relation to its chiropterofauna, with only 11 species currently recorded (*Desmodus rotundus, Diphylla ecaudata, Lonchorhina aurita* Tomes, 1863, *Artibeus planirostris, Trachops cirrhosus, Natalus macrourus* (Gervais, 1856), *Peropteryx macrotis, Dermanura cinerea* (Gervais, 1856), *Molossus molossus* (Pallas, 1766), *Myotis nigricans* (Schinz, 1821), *Glossophaga soricina*; Oliveira et al. 2003; Feijó & Nunes 2010; Ferreira et al. 2010; Barros 2014). With 949 cavities currently cataloged, the state is fourth in Brazil for the number of natural underground cavities (CECAV/ICMBio 2016), which constitute potential important roost for the bat communities in the Caatinga of the state.

Anincrease of bat inventories in Rio Grande do Norte, both in caves as well as in other habitats, should provide a better understanding of the distribution of *C. auritus* and more generally the species richness in this state and in the Caatinga biome.

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